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# Cost of Field Operations in the Prairie Region



Self-propelled combine-harvesting costs on Illustration Stations in 1957 averaged \$2.75 per acre and \$9.08 per hour.

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Ottawa, Ontario



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# **COST OF FIELD OPERATIONS IN THE PRAIRIE REGION**

**ILLUSTRATION STATIONS DIVISION  
EXPERIMENTAL FARMS SERVICE**

**CANADA DEPARTMENT OF AGRICULTURE  
Ottawa, Ontario**



## FOREWORD

Illustration Stations are private farms of which the owners are co-operating with the Experimental Farms Service in a research and developmental program. To these farm owner-operators, the Experimental Farms Service extends appreciation for their co-operation in this project.

This report is a joint contribution of the following personnel of the Illustration Stations Division: B.J. Gorby, Brandon Experimental Farm; R.E. Laurin and K.E. Bowren, Melfort Experimental Farm; R.N. McIver, Indian Head Experimental Farm; C.H. Keys, Scott Experimental Farm; N.A. Korven and G.K. Harris, Swift Current Experimental Farm; A.D. Smith, Lethbridge Experimental Farm; L.J. Anderson and S.R. Church, Lacombe Experimental Farm; and I.F. Furniss, Central Experimental Farm, Ottawa.

Cover picture by D.A. Duncan, Central Experimental Farm. "Harvesting a crop of creeping red fescue on the farm of H.G. Hadland, Baldonnel, B.C., July 31, 1958." Yield was 600 to 800 pounds per acre.

ILLUSTRATION STATIONS DIVISION  
EXPERIMENTAL FARMS SERVICE

CANADA DEPARTMENT OF AGRICULTURE  
Ottawa, Ontario

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## COST OF FIELD OPERATIONS IN THE PRAIRIE REGION

### Introduction

Data are presented in this report for a total of 41 field operations at 11 Illustration Station farms located in the Experimental Farm districts of Brandon, Man. (13); Indian Head, Sask. (10); Melfort, Sask. (5); Swift, Sask. (10); Swift Current, Sask. (14); Lethbridge, Alta. (5); and Lacombe, Alta. (4). For certain field operations, the data have been subdivided by type and size of machine. All the data presented were obtained during the crop-year, 1957. The figures presented can be classified as average for each of crops for most field operations at certain station farms in the Prairie Region.

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Variations in costs between locations were attributed to a number of factors, the more significant ones being size of machine, speed of operation, type of machine and capital cost of machine. Most uniformity in type of machines in a group resulted in correspondingly less variation in costs. However, there was a wide variety of machines used for certain categories of field operations; consequently there was a wide variation in cost and a high coefficient of variability. In all cases except haying costs per acre varied more than costs per hour.

### Summary of Results

The data are presented in the accompanying nine tables. For each operation, or combination, is given the number of records, average costs, the high and low costs representing 95 per cent of the range of costs and the co-efficient of variability.







## COST OF FIELD OPERATIONS IN THE PRAIRIE REGION

### Introduction

Data are presented in this report for a total of 41 field operations at 71 Illustration Station farms located in the Experimental Farm districts of: Brandon, Man. (13); Indian Head, Sask. (10); Melfort, Sask. (6); Scott, Sask. (10); Swift Current, Sask. (14); Lethbridge, Alta. (9); and Lacombe, Alta. (9). For certain field operations, the data have been subsorted by type and size of machine. All the data presented were obtained during the crop-year, 1957. The figures presented can be considered to represent the range of costs for most field operations on these station farms at current prices.

### Methods

These cost data include charges for both the power unit, if not self-propelled, and the implement. Charges include allowances for interest on average investment at 6 per cent plus depreciation and repairs; the latter are based on the rates established by J.L. Thompson and A. Wenhardt in: *Cost Charges for Agricultural Machinery (Western Canada)*, publication 881, Canada Department of Agriculture. Operating costs for fuel, oil and grease were charged at delivered prices at the farm. Man-labor was charged at \$1.05 per hour at all locations and for all operations. Combine-harvesting costs, as given here, include all costs for operating the machine, plus the tractor when required, but not the costs for hauling grain from the combine-harvester.

The average cost, the standard deviation, and the coefficient of variability (C.V.) for each field operation were calculated. One standard deviation represents the deviation from the average occurring in approximately 68 per cent of all records studied. The "range" is expressed in this report in terms of the average, plus and minus one standard deviation. For the type of data in this study, such a range was considered more meaningful than the complete range which would include some extremely high or low values. The C.V. represents one standard deviation expressed as a percentage of the mean (average). The lower the C.V. value the more uniform the average costs. Where there were five or less observations, the standard deviation and C.V. were not calculated.

Variations in costs between locations were attributed to a number of factors, the more significant ones being size of machine, speed of operation, type of machine and capital cost of machine. More uniformity in type of machines in a group resulted in correspondingly less variation in costs. However, there was a wide variety of machines used for certain categories of field operations; consequently there was a wide variation in cost and a high coefficient of variability. In all cases except binding costs per acre varied more than costs per hour.

### Summary of Results

The data are presented in the accompanying nine tables. For each implement, or combination, is given the number of records, average costs, the high and low costs representing 68 per cent of the range of costs and the co-efficient of variability.



In tables 1 and 2, a total of 20 *tillage* operations are presented. These include a number of combined operations for which only a few observations were made. The combined operations resulted in reducing man-labor costs, but increased other charges as larger and more expensive machines were used. On the average, plowing, because of the small area covered per hour, was the most costly tillage operation per acre. The disker, for single operations, was the most expensive per hour, largely because of the high capital cost of the implement and the power unit.

Costs of *seeding* operations are summarized in Tables 3 and 4. These were tabulated for a total of three major machines and nine miscellaneous combinations and types. With the disker, drill, or one-way the costs per acre ranged from a low of \$0.50 with a drill to \$1.32 with a one-way. Costs per hour for one-ways ranged from \$2.62 to \$4.24.

*Spraying* costs are also given in Tables 3 and 4. These were sorted by three sizes of boom width. A figure for all sprayers is also given. Costs per acre for spraying were the most variable of all field operations considered. The majority of sprayers on farms in this study covered 30 to 33 feet. There were not enough records in the other two size groups to establish significant cost differences.

Costs of *hay harvesting* were obtained for five basic operations with raking costs being sorted by dump or side-delivery type of machine (Tables 5 and 6).

*Grain harvesting* costs were calculated for three basic operations with swathing and combine-harvesting being subsorted by type of machine. Considerable variability existed within the self-propelled combine-harvester group. Combine-harvesting costs per acre for the three types of machines started off at approximately the same lower limits but self-propelled machines were the most expensive per acre on the average. On an hourly basis, self-propelled combine-harvesters were again the most expensive to operate. Costs to operate a self-propelled swather exhibited a consistently higher trend than for a tractor-operated swather. However, only four observations for the former were available.

An analysis was undertaken to establish if there was any *effect from size on costs of operating self-propelled grain combines*. Data for this analysis are summarized in Table 9 by four size categories. These data indicate a significant (at the 1 per cent level) inverse relationship between size, as measured by "table width," and costs of operation per acre; as size goes up costs per acre go down. This would be partly the result of factors such as increased cylinder threshing capacity and higher forward speeds for the larger machines. The limited amount of data available does not permit any more specific conclusions and it is likely that other factors than size, using this classification, would also tend to affect costs. It will be noted in Table 9 that the data on the range of costs indicates an overlapping between sizes. It should be noted that grain-combines can usually be obtained in two "table" sizes for the same cylinder capacity. There were no statistically significant differences between the average use of each size group of combines in 1957; hours of use averaged 122 per grain-combine.



Table 1. Cost per Acre of Tillage Operations

| Type of Operation            | Number<br>of<br>Records | Average<br>of all<br>Records | Extremes <sup>a</sup> of 68% Coefficient<br>of Cost Records |       | Coefficient<br>of<br>Variability |
|------------------------------|-------------------------|------------------------------|---|-------|----------------------------------|
|                              |                         |                              | High  | Low   |                                  |
|                              |                         | \$                           | \$  | \$    | %                                |
| Blade                        | 13                      | 0.89                         | 1.03  | 0.75  | 15.7                             |
| Cultivator                   | 57                      | 0.77                         | 0.99  | 0.55  | 28.6                             |
| Disk, various types          | 15                      | 0.80                         | 1.05  | 0.55  | 31.2                             |
| Disk                         | 39                      | 0.71                         | 0.91  | 0.51  | 28.2                             |
| Drag Harrow                  | 46                      | 0.30                         | 0.41  | 0.19  | 36.7                             |
| One-way                      | 33                      | 1.15                         | 1.59  | 0.71  | 38.3                             |
| Plow                         | 28                      | 1.94                         | 2.68  | 1.20  | 38.1                             |
| Rod Weeder                   | 16                      | 0.47                         | 0.61  | 0.33  | 29.8                             |
| Miscellaneous:               |                         |                              |   |       |                                  |
| Chisel Plow                  | 4                       | 0.72                         | 1.01*   | 0.46* | —                                |
| Chisel Plow with Rod Weeder  | 1                       | 0.52                         | —   | —     | —                                |
| Cultivator with Drag Harrows | 1                       | 1.35                         | —   | —     | —                                |
| Cultivator with Rod Weeder   | 1                       | 0.97                         | —   | —     | —                                |
| Cultivator with Spikes       | 2                       | 1.65                         | —   | —     | —                                |
| Cultivator with Sweeps       | 2                       | 0.92                         | —   | —     | —                                |
| Drag Harrow, heavy duty      | 1                       | 0.89                         | —   | —     | —                                |
| One-way with Disk            | 1                       | 0.56                         | —   | —     | —                                |
| Oscillating Harrow           | 5                       | 0.41                         | 0.51*   | 0.27* | —                                |
| Packer                       | 2                       | 0.34                         | —   | —     | —                                |
| Rod Weeder with Drag Harrow  | 1                       | 0.48                         | —   | —     | —                                |
| Spring-tooth Harrow          | 3                       | 0.45                         | 0.55*   | 0.39* | —                                |

<sup>a</sup>At P = 0.32 (approx.) level

\*Range of all records



Table 2. Cost per Hour of Tillage Operations

| Type of Operation            | Number<br>of<br>Records | Average<br>of all<br>Records | Extremes <sup>a</sup> of Cost Records |       | Coefficient<br>of<br>Variability |
|------------------------------|-------------------------|------------------------------|---------------------------------------|-------|----------------------------------|
|                              |                         |                              | High                                  | Low   |                                  |
|                              |                         | \$                           | \$                                    | \$    | %                                |
| Blade                        | 13                      | 3.00                         | 3.45                                  | 2.55  | 15.0                             |
| Cultivator                   | 57                      | 2.87                         | 3.26                                  | 2.48  | 13.6                             |
| Disk, various types          | 15                      | 2.71                         | 3.27                                  | 2.15  | 20.7                             |
| Diskier                      | 39                      | 3.45                         | 3.96                                  | 2.94  | 14.8                             |
| Drag Harrow                  | 46                      | 2.50                         | 2.79                                  | 2.21  | 11.6                             |
| One-way                      | 33                      | 2.99                         | 3.62                                  | 2.36  | 21.0                             |
| Plow                         | 28                      | 2.80                         | 3.17                                  | 2.43  | 13.2                             |
| Rod Weeder                   | 16                      | 2.91                         | 3.29                                  | 2.53  | 13.0                             |
| Miscellaneous:               |                         |                              |                                       |       |                                  |
| Chisel Plow                  | 4                       | 3.43                         | 3.70*                                 | 3.17* | —                                |
| Chisel Plow with Rod Weeder  | 1                       | 3.56                         | —                                     | —     | —                                |
| Cultivator with Drag Harrows | 1                       | 4.04                         | —                                     | —     | —                                |
| Cultivator with Rod Weeder   | 1                       | 3.89                         | —                                     | —     | —                                |
| Cultivator with Spikes       | 2                       | 2.85                         | —                                     | —     | —                                |
| Cultivator with Sweeps       | 2                       | 2.89                         | —                                     | —     | —                                |
| Drag Harrow, heavy duty      | 1                       | 1.94                         | —                                     | —     | —                                |
| One-way with Diskier         | 1                       | 3.92                         | —                                     | —     | —                                |
| Oscillating Harrow           | 5                       | 2.55                         | 2.95*                                 | 2.06* | —                                |
| Packer                       | 2                       | 2.54                         | —                                     | —     | —                                |
| Rod Weeder with Drag Harrow  | 1                       | 3.71                         | —                                     | —     | —                                |
| Spring-tooth Harrow          | 3                       | 2.77                         | 3.09*                                 | 2.60* | —                                |

<sup>a</sup>At P = 0.32 (approx.) level

\* Range of all records



Table 3. Cost per Acre of Seeding and Spraying Operations

| Type of Operation                     | Number<br>of<br>Records | Average<br>of all<br>Records | Extremes <sup>a</sup> of Cost Records |       | Coefficient<br>of<br>Variability |
|---------------------------------------|-------------------------|------------------------------|---------------------------------------|-------|----------------------------------|
|                                       |                         |                              | High                                  | Low   |                                  |
|                                       |                         | \$                           | \$                                    | \$    | %                                |
| Seeding:                              |                         |                              |                                       |       |                                  |
| Diskier                               | 17                      | 0.70                         | 0.80                                  | 0.60  | 14.3                             |
| Drill                                 | 44                      | 0.78                         | 1.06                                  | 0.50  | 35.9                             |
| One-way                               | 8                       | 1.01                         | 1.32                                  | 0.70  | 30.7                             |
| Miscellaneous:                        |                         |                              |                                       |       |                                  |
| Drill with Diskier and Packer         | 1                       | 1.24                         | —                                     | —     | —                                |
| Drill with One-way                    | 1                       | 1.93                         | —                                     | —     | —                                |
| Drill with One-way and Packer         | 1                       | 0.80                         | —                                     | —     | —                                |
| Drill and Packer                      | 3                       | 1.04                         | 1.33*                                 | 0.83* | —                                |
| Drill and Rod Weeder                  | 1                       | 0.97                         | —                                     | —     | —                                |
| Hoe Drill                             | 1                       | 1.16                         | —                                     | —     | —                                |
| One-way seeding with Packer           | 1                       | 0.70                         | —                                     | —     | —                                |
| Pony Press Drill with Plow and Packer | 1                       | 3.11                         | —                                     | —     | —                                |
| Press Drill                           | 2                       | 1.36                         | —                                     | —     | —                                |
| Spraying:                             |                         |                              |                                       |       |                                  |
| Under 30' Boom                        | 2                       | 0.21                         | —                                     | —     | —                                |
| 30' — 33' Boom                        | 22                      | 0.20                         | 0.30                                  | 0.10  | 47.5                             |
| Over 33' Boom                         | 2                       | 0.07                         | —                                     | —     | —                                |
| All Sprayers                          | 26                      | 0.19                         | 0.29                                  | 0.09  | 51.1                             |

<sup>a</sup>At P = 0.32 (approx.) level

\* Range of all records



Table 4. Cost per Hour of Seeding and Spraying Operations

| Type of Operation                     | Number<br>of<br>Records | Average<br>of all<br>Records | Extremes <sup>a</sup><br>of Cost<br>High | Extremes <sup>a</sup><br>of Cost<br>Low | Coefficient<br>of<br>Variability |
|---------------------------------------|-------------------------|------------------------------|--|---|----------------------------------|
|                                       |                         | \$                           | \$                                       | \$                                      | %                                |
| Seeding:                              |                         |                              |  |   |                                  |
| Disk                                  | 17                      | 3.57                         | 3.90                                     | 3.24                                    | 9.2                              |
| Drill                                 | 44                      | 3.21                         | 3.93                                     | 2.49                                    | 22.4                             |
| One-way                               | 8                       | 3.43                         | 4.24                                     | 2.62                                    | 23.6                             |
| Miscellaneous:                        |                         |                              |  |   |                                  |
| Drill with Disk and Packer            | 1                       | 4.59                         | —  | —                                       | —                                |
| Drill with One-way                    | 1                       | 2.19                         | —  | —                                       | —                                |
| Drill with One-way and Packer         | 1                       | 4.85                         | —  | —                                       | —                                |
| Drill and Packer                      | 3                       | 3.67                         | 4.04*                                    | 3.31*                                   | —                                |
| Drill and Rod Weeder                  | 1                       | 3.87                         | —  | —                                       | —                                |
| Hoe Drill                             | 1                       | 5.78                         | —  | —                                       | —                                |
| One-way seeding with Packer           | 1                       | 4.15                         | —  | —                                       | —                                |
| Pony Press Drill with Plow and Packer | 1                       | 3.11                         | —  | —                                       | —                                |
| Press Drill                           | 2                       | 3.72                         | —  | —                                       | —                                |
| Spraying:                             |                         |                              |  |   |                                  |
| Under 30' Boom                        | 2                       | 2.34                         | —  | —                                       | —                                |
| 30' — 33' Boom                        | 22                      | 2.61                         | 3.10                                     | 2.12                                    | 18.8                             |
| Over 33' Boom                         | 2                       | 2.94                         | —  | —                                       | —                                |
| All Sprayers                          | 26                      | 2.62                         | 3.09                                     | 2.15                                    | 17.9                             |

<sup>a</sup>At P = 0.32 (approx.) level

\*Range of all records



Table 5. Cost per Acre of Hay Harvesting Operations

| Type of Operation      | Number<br>of<br>Records | Average<br>of all<br>Records | Extremes <sup>a</sup> of 68%<br>of Cost Records |       | Coefficient<br>of<br>Variability |
|------------------------|-------------------------|------------------------------|---|-------|----------------------------------|
|                        |                         |                              | High  | Low   |                                  |
|                        |                         | \$                           | \$  | \$    | %                                |
| Bale                   | 16                      | 2.08                         | 2.90  | 1.26  | 39.4                             |
| Forage Harvester       | 2                       | 2.44                         | 2.57*   | 2.31* | —                                |
| Mow, tractor types     | 28                      | 1.12                         | 1.44  | 0.80  | 28.6                             |
| Rake:                  |                         |                              |   |       |                                  |
| Dump                   | 5                       | 0.76                         | 1.30*   | 0.46* | —                                |
| Side delivery          | 16                      | 0.92                         | 1.20  | 0.64  | 30.4                             |
| Stacker and sweep rake | 5                       | 1.89                         | 3.02*   | 1.01* | —                                |

<sup>a</sup> At P = 0.32 (approx.) level

\*Range of all records

Table 6. Cost per Hour of Hay Harvesting Operations

| Type of Operation      | Number<br>of<br>Records | Average<br>of all<br>Records | Extremes <sup>a</sup> of 68%<br>of Cost Records |       | Coefficient<br>of<br>Variability |
|------------------------|-------------------------|------------------------------|---|-------|----------------------------------|
|                        |                         |                              | High  | Low   |                                  |
|                        |                         | \$                           | \$  | \$    | %                                |
| Bale                   | 16                      | 5.34                         | 6.33  | 4.35  | 18.5                             |
| Forage Harvester       | 2                       | 4.12                         | 5.14*   | 3.09* | —                                |
| Mow, tractor types     | 28                      | 2.67                         | 3.04  | 2.30  | 13.8                             |
| Rake:                  |                         |                              |   |       |                                  |
| Dump                   | 5                       | 2.31                         | 2.72*   | 1.49* | —                                |
| Side delivery          | 16                      | 2.76                         | 3.20  | 2.32  | 15.9                             |
| Stacker and sweep rake | 5                       | 3.66                         | 4.44*   | 1.80* | —                                |

<sup>a</sup> At P = 0.32 (approx.) level

\*Range of all records



Table 7. Cost per Acre of Grain Harvesting Operations

| Type of Operation  | Number<br>of<br>Records | Average<br>of all<br>Records | Extremes <sup>a</sup> of 68%<br>of Cost Records |       | Coefficient<br>of<br>Variability |
|--------------------|-------------------------|------------------------------|---|-------|----------------------------------|
|                    |                         |                              | High  | Low   |                                  |
|                    |                         | \$                           | \$  | \$    | %                                |
| Binder             | 11                      | 1.63                         | 2.14  | 1.12  | 31.3                             |
| Combine-harvester: |                         |                              |   |       |                                  |
| Auxiliary Motor    | 16                      | 2.49                         | 3.33  | 1.65  | 33.7                             |
| Power-take-off     | 4                       | 1.86                         | 2.58*   | 1.52* | —                                |
| Self-propelled     | 41                      | 2.75                         | 3.95  | 1.55  | 43.5                             |
| Swather:           |                         |                              |   |       |                                  |
| With Tractor       | 49                      | 0.68                         | 0.94  | 0.42  | 39.0                             |
| Self-propelled     | 4                       | 0.92                         | 1.12*   | 0.82* | —                                |

<sup>a</sup>At P = 0.32 (approx.) level

\*Range of all records

Table 8. Cost per Hour of Grain Harvesting Operations

| Type of Operation  | Number<br>of<br>Records | Average<br>of all<br>Records | Extremes <sup>a</sup> of 68%<br>of Cost Records |       | Coefficient<br>of<br>Variability |
|--------------------|-------------------------|------------------------------|---|-------|----------------------------------|
|                    |                         |                              | High  | Low   |                                  |
|                    |                         | \$                           | \$  | \$    | %                                |
| Binder             | 11                      | 3.90                         | 5.41  | 2.39  | 38.7                             |
| Combine-harvester: |                         |                              |   |       |                                  |
| Auxiliary Motor    | 16                      | 6.62                         | 8.01  | 5.23  | 21.0                             |
| Power-take-off     | 4                       | 4.85                         | 5.94*   | 3.88* | —                                |
| Self-propelled     | 41                      | 9.08                         | 11.26   | 6.90  | 24.0                             |
| Swather:           |                         |                              |   |       |                                  |
| With Tractor       | 49                      | 3.37                         | 3.87  | 2.87  | 14.8                             |
| Self-propelled     | 4                       | 4.68                         | 6.04*   | 4.09* | —                                |

<sup>a</sup>At P = 0.32 (approx.) level

\*Range of all records



Table 9. Costs of Operating Self-propelled Grain-combines of Different Sizes

| Size of Grain-Combine        | Number of Machines | Operating Costs per Acre |                     |                    | Annual Use  |
|------------------------------|--------------------|--------------------------|---------------------|--------------------|-------------|
|                              |                    | Average                  | High of all Records | Low of all Records |             |
|                              |                    | \$                       | \$                  | \$                 | hr.         |
| 10-foot                      | 6                  | 4.62                     | 5.51                | 3.68               | 127         |
| 12-foot                      | 15                 | 3.16                     | 5.03                | 1.98               | 103         |
| 14-foot <sup>1</sup>         | 10                 | 2.10                     | 3.05                | 1.65               | 124         |
| 16-foot                      | 9                  | 1.76                     | 2.06                | 1.15               | 150         |
| All Sizes                    | 40                 | 2.80                     | 5.51                | 1.15               | 122         |
| "F-Value" for Between Groups |                    | 25.74*                   | —                   | —                  | 2.19 (N.S.) |

\*Denotes significance at the  $P = .01$  level.

N.S. Denotes non-significance.

<sup>1</sup>Data for one 14-foot combine-harvester with extremely low costs were omitted.



